

Teamcenter Manufacturing Helps Connect All Domains of the Design / Build Lifecycle

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Summary

Siemens PLM Software, with its Teamcenter Manufacturing platform, addresses the expanded scope of PLM and the end-to-end product/process/production lifecycle by offering a collaborative design/build platform.

Today's manufacturing methods and processes have evolved in numerous ways over the decades with more advanced machines and production equipment, fully automated work cells, highly efficient workflow and tracking systems enabled by next-generation factory floor IT, and extremely productive workers. Yet, despite these advancements, the manufacturing build process within the context of the design/build lifecycle remains composed of the same basic domains: manufacturing planning, workflow and resource management, and shop floor execution systems. While these domains have become more complex and the solutions more sophisticated, they remain largely unconnected across the end-to-end design/build/operate/maintain lifecycle that defines today's PLM solution set.

Manufacturers are clearly becoming more PLM-centric as they adopt and implement the extended solution set that encompasses the expanded scope of PLM across the product lifecycle. Siemens PLM Software, with its Teamcenter Manufacturing platform addresses the expanded scope of PLM and the end-to-end product/process/production lifecycle by offering a collaborative design/build platform that connects all the manufacturing domains, from manufacturing process creation to validation of as-built to as-designed.

Teamcenter Manufacturing Supports the Complete Design / Build Process

When industry began to adopt the basic tenets of lean manufacturing and continuous process improvement (CPI) several decades ago, it had a significant impact on manufacturing practices and changed how manufacturers would approach their manufacturing processes going forward. Clearly,



the implementation of lean manufacturing principles and the adoption of CPI signaled a major change in manufacturing processes that affected the efficiency of production as well as the ultimate quality of the product. Lean manufacturing, at the most basic level, simply means to eliminate all waste in time, motion, material, and workflow. Additionally, applying CPI concepts and practices meant building the quality into the production processes in a continuous manner to produce an inherently quality product free of defects, thus eliminating the need for end-item inspection in which defects were found and parts scrapped.

While the adoption and implantation of lean manufacturing and CPI changed manufacturing forever, manufacturers still needed better analysis tools and open access to and exchange of production process information between the various design/build domains to realize the full benefits of these principles and practices. Moreover, there has been a lack of connection between the product design and production planning domains and shop floor operations and execution, which requires PLM-to-MES integration. This lack of connection placed significant constraints on the manufacturers' ability to understand and manage change across the design/build lifecycle and, more specifically, between the as-built to as-designed. Currently, most manufacturers compile and place their completed operations and inspection records in some form of a production records repository. Unfortunately, the majority of these completed records are not analyzed and thus do not complete the feedback loop from as-built to as-designed that's needed to facilitate CPI.

Teamcenter Manufacturing Represents a Single Repository for Product and Production Processes

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The emergence of collaborative design/build platforms, such as Siemens PLM Software's Teamcenter Manufacturing, help address the deficiencies of connection and integration found in today's manufacturing environment. Teamcenter Manufacturing, which functions as a core element of the overall Teamcenter product and process lifecycle management platform, provides a single repository for all manufacturing knowledge. This means that all the stakeholders involved in the design/build process — product designers, manufacturing engineers, part and assembly planners, industrial engineers, tool engineers, and shop floor production workers — have access to the same product and production

process models, data, analytics, workflow, and overall manufacturing knowledge necessary to complete the design/build process from design concept to shop floor execution.

Understanding and Managing Change Is Essential to the Product and Production Lifecycle Process

Teamcenter provides a critical function across the product and production lifecycle that is essential to any successful design/build process: the ability to implement, manage, and understand the impact of change. This focuses on one of the basic requirements in all product & production engineering, a system that can manage change and version control. Historically, change management has, for the most part, been limited to product design, with some penetration into manufacturing planning.

It is one thing to manage change throughout product engineering and manufacturing processes. However, today's manufacturing environment demands more than merely managing change. To remain viable in a highly competitive market, companies must be able consistently improve both product and production processes. Teamcenter Manufacturing can help today's manufacturers to manage and understand the impact of change, not only change involving product design and manufacturing engineering, but encompasses all the design/build domains. These include industrial and tool engineering all the way down to the shop floor operations and execution activities. In this way, change that occurs at the as-built level can be captured and analyzed using "what-if" analytical tools. These would enable manufacturers to validate this against as-designed information for both product and production.

Validating the As-Built Process to the As-Designed

Since Teamcenter Manufacturing provides a single repository and collaborative platform for all product and production information, it allows stakeholders across the design/build process to create, implement, and manage all the typical product manufacturing stages. From an end-to-end PLM perspective, this would involve integrating product design with manufacturing processes and production operations that enable validation of the as-built processes.

From the perspective of lifecycle product design, tools define form, fit, and function, or "what" is to be built. Manufacturing process tools and digital manufacturing simulation define "how" the product is to be built. And

factory operations executes design intent and the manufacturing plan and defines “when & where” to build. To maintain a natural cohesion between these stages, Teamcenter Manufacturing provides an interoperable environment for integrating these domains. This enables production operations to close the loop between the virtual build enabled by digital manufacturing tools and the physical build knowledge captured in the operations and inspection records. One of the most significant benefits of digital manufacturing simulation tools (along with other production tools such as workflow, time, and workplace analysis) is that these tools enable production engineers to validate the production process prior to physical implementation. Moreover, capturing information and knowledge from the execution of production operations and applying this “learned knowledge” and understanding to the creation of new production processes further enhances virtual production process validation.

Conclusion

It has been obvious for some time that manufacturers must continuously improve their production processes to maintain quality assurance, as well as reduce time to product launch and actual production time. Further, it is clear that innovation must not only involve new products and markets, but must be an integral part of continuous process improvement in the manufacturing environment. All innovation is predicated on knowledge, whether acquired from new research and discovery, or from established methods and processes. In the case of production processes, knowledge can be captured from the completed records of operations and inspection execution on the factory floor.

What will eventually make this captured knowledge useful to product design and production engineers is an integrated manufacturing environment that allows this knowledge to be analyzed, aggregated, and applied to existing production processes so that they can be understood, improved continuously, and validated. Teamcenter Manufacturing appears to provide such an integrated and collaborative manufacturing environment.

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